

**RESEARCH OPPORTUNITIES IN SPACE SCIENCE - 2003
(ROSS-2003)**

NASA Research Announcement
Soliciting Basic Research Proposals

NRA 03-OSS-01
Issued: January 31, 2003

Proposals Due
Starting Mar. 28, 2003,
through Feb. 13, 2004

Office of Space Science
National Aeronautics and Space Administration
Washington, DC 20546-0001

RESEARCH OPPORTUNITIES IN SPACE SCIENCE - 2003 (ROSS-2003)

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RESEARCH OPPORTUNITIES IN SPACE SCIENCE - 2003 (ROSS-2003)

SUMMARY OF SOLICITATION

1. INTRODUCTION TO SOLICITED RESEARCH OBJECTIVES

The recent development of the National Aeronautics and Space Administration's (NASA) Vision Statement,

To improve life here, to extend life to there, and to find life beyond,
and Mission Statement,

*To understand and protect our home planet,
To explore the Universe and search for life, and
To inspire the next generation of explorers
...as only NASA can,*

now allows the objectives and goals of the NASA Space Science Enterprise to be clearly defined as the orderly pursuit of two key strategic goals: To explore the fundamental principles of physics, chemistry, and biology through research in the unique natural laboratory of space, and to explore the solar system and the universe beyond, understand the origin and evolution of life, and search for evidence of life elsewhere.

In order to pursue these strategic goals, NASA's Office of Space Science (OSS) sponsors a broad range of research programs as organized by its four defined science themes:

- *Astronomical Search for Origins and Planetary Systems (ASO)* that addresses the origins of galaxies, stars, proto-planetary and extra-solar planetary systems, Earth-like planets, and the origin of life;
- *Exploration of the Solar System (ESS)* that seeks to understand all aspects of our Solar System, including the planets, satellites, small bodies, and Solar System materials, and the search for possible habitats of life beyond Earth;
- *Structure and Evolution of the Universe (SEU)* that involves the study of cosmology, the large scale structure of the Universe, the evolution of stars and galaxies, including the Milky Way and objects with extreme physical conditions, and an examination of the ultimate limits of gravity and energy in the Universe; and
- *The Sun-Earth Connection (SEC)* that concerns the Sun as a typical star and as the controlling agent of the space environment of the Solar System, especially the Earth.

(Further information about these themes, as well as access to the most recent Strategic Plans, for both NASA and OSS, may be found through the menu items "Administration->Publications" from the OSS homepage on the World Wide Web at <http://spacescience.nasa.gov>).

OSS pursues these strategic goals and science themes using a wide variety of both space flight programs and investigations in basic science and technology. This current NASA

Research Announcement (NRA), entitled *Research Opportunities in Space Science (ROSS)-2003*, solicits proposals for Supporting Research and Technology (SR&T) investigations that seek to understand naturally occurring space phenomena and space science-related technologies. Proposals in response to this NRA should be submitted to the most relevant science Program Elements given in Appendix A (see also the Table of Contents that prefaces this *Summary of Solicitation*). Table 1 at the end of this *Summary* lists these Program Elements in the order of their deadlines for the submission of proposals, while Table 2 lists them in the order in which they are organized in the Table of Contents, as well as in Appendix A. Tables 1 and 2 also cross reference these Program Elements to the four OSS Science Themes noted above. Appendix A contains detailed descriptions of each Program Element, and questions about each may be directed to the Program Officer(s) identified in the "Programmatic Information" section that concludes each one.

In keeping with the mid-2001 reorganization of the Office of Space Science into its three scientific Divisions,

- Astronomy and Physics,
- Solar System Exploration, and
- The Sun-Earth Connection,

the Program Elements in Appendix A are now organized into four sections, of which the first three are managed respectively by these three OSS Divisions while the fourth one contains Interdisciplinary Program Elements relevant to two or more of these science Divisions. Each of these four main sections of Appendix A is prefaced with an "Overview" subsection that provides an introduction to its program content that all interested applicants to this NRA should read before preparing their proposals.

Recommendations for funding for the proposals submitted to this NRA will be based on the peer evaluation of each proposal's intrinsic merit, its relevance to NASA's objectives, and its cost. NASA's Vision and Mission given above now allow the second of these criteria, that of "relevance," to be clearly defined with respect to the overarching objectives of the Space Science enterprise and this NRA. In particular, working in close cooperation with the space science community in a variety of venues, the first two NASA Mission objectives relevant to science have been expanded to define and organize a series of key Science Objectives and subsidiary Research Focus Areas (RFA's) for OSS as shown in Table 3 below (Note: these Science Objectives and RFA's are also used to assess NASA's research progress for compliance with the *Government Performance Review Act* (GPRA) of 1993). Therefore, proposers to this NRA are expected to provide a short statement in their proposals that shows how their proposed research activities support one or more of these Science Objectives and their related RFA's (note: further instructions of how this is to be done is provided in the first section of every Program Element given in Appendix A). The third element of the NASA Mission is directly addressed by the OSS Education and Public Outreach (E/PO) program that is discussed further in Section 4 below.

2. GENERAL POLICIES

2.1 NECESSARY AND SUFFICIENT CONDITIONS FOR SELECTIONS

The Government's obligation to make awards through any program element announced through this NRA is contingent upon the availability of appropriated funds through the Federal budget process from which payment can be made, and the receipt of proposals in response to this NRA that NASA determines through peer and programmatic reviews are acceptable for award.

2.2 INCLUSIVENESS OF PROGRAM APPLICANTS

Participation in this program is open to all categories of U.S. and non-U.S. organizations, including educational institutions, industry, nonprofit institutions, as well as NASA Centers, and other U.S. Government agencies. Historically Black Colleges and Universities (HBCU's), other minority educational institutions, and small businesses and organizations owned and controlled by socially and economically disadvantaged individuals or women are particularly encouraged to apply. Participation by non-U.S. organizations in this program is encouraged subject to NASA's policy of no-exchange-of-funds (see further information in the *NASA Guidebook for Proposers* discussed below).

2.3 SAFETY POLICY FOR SELECTED INVESTIGATIONS

All prospective proposers to this NRA are advised that the highest priority in all of NASA's programs is given to safety and mission assurance, occupational health, environmental protection, information technology, export control, and security. NASA's safety priorities are to protect: (i) the public, (ii) astronauts and pilots, (iii) the NASA workforce (including employees working under NASA instruments), and (iv) high-value equipment and property. All proposals submitted in response to this solicitation are expected to comply with this policy.

3. INSTRUCTIONS FOR PREPARATION AND SUBMISSION OF PROPOSALS

All policies and procedures for the preparation and submission of proposals, as well as those for NASA's review and selection of proposals for funding, are now presented in a separate document entitled *Guidebook for Proposers Responding to NASA Research Announcements* (abbreviated as the *NASA Guidebook for Proposers*) that is accessible by opening the single Web site portal for the submission of proposals to any of the NASA program offices at the World Wide Web URL <http://research.hq.nasa.gov/research/cfm>, and linking through the menu item "Helpful References," or that may be directly accessed at URL <http://www.hq.nasa.gov/office/procurement/nraguidebook/>.

By reference, the newest edition of this *NASA Guidebook for Proposers, Edition: 2003 (January 2003)* is hereby incorporated into this ROSS-2003 NRA, and proposers to this NRA are responsible for understanding and complying with its procedures before

preparing and submitting their proposals. Proposals that do not conform to its standards may be declared noncompliant and returned without review. Note that the required proposal *Budget Summary* is now combined with that for the *Cover Page/Proposal Summary* as one contiguous file. After the requested data are entered, the entirety of these contiguous forms are printed and signed by the designated personnel for submission with the required hard copies of the proposal.

The other chapters and appendices of this *NASA Guidebook for Proposers* provide supplemental information about the entire NRA process, including NASA policies for the solicitation of proposals, guidelines for writing complete and effective proposals, the NASA policies and procedures for the review and selection of proposals, as well as for issuing and managing the awards to the institutions that submitted selected proposals, and Frequently Asked Questions (FAQ's) about a variety of the NASA proposal and award processes and procedures. Note that the NASA policy for proposals involving non-U.S. participants is given in Section (I) of Appendix B of this *Guidebook*. Comments and suggestions of any nature about this *Guidebook* are encouraged and welcomed and may be directed at any time to Ms. Rita Svarcas, Office of Procurement, Code H, NASA Headquarters, Washington, DC 20546-0001; E-mail: Rita.Svarcas-1@nasa.gov.

The World Wide Web site for submitting both a Notice of Intent (NOI) to propose (which is encouraged but not required) and a proposal's *Cover Page/Proposal Summary* and *Budget Summary* is given in Section 6, *Summary Information*, below (also Chapters 2 and 3 of the *Guidebook for Proposers* contain detailed information about these two subjects, respectively). A point of contact for assistance in accessing and/or using this Web site is given in the *Summary Information* below; nevertheless, interested applicants to this NRA are urged to access this site well in advance of the various due dates for materials to familiarize themselves with its structure. It is especially important to note that every individual named on the proposal's *Cover Page* must be registered in the NASA data system that is accessible through this Web site and further, that such individuals must perform this registration themselves, i.e., a person may not be registered by a second party, even the Principal Investigator of the proposal in which that person is committed to participate.

4. OSS EDUCATION AND PUBLIC OUTREACH PROGRAM

As noted earlier, one of the three core missions of NASA is "...to inspire the next generation of Explorers as only NASA can." As part of its response to this mandate, the Office of Space Science is committed to fostering the broad involvement of the space science community in Education and Public Outreach (E/PO) with the goal of enhancing the Nation's formal education system and contributing to the broad public understanding of science, mathematics, and technology. Progress towards achieving this goal has become an important part of the broad justification for the public support of space science. OSS's work is also a significant element of the overall NASA education program. In response to education now being a core mission of NASA, an enhanced, coordinated Agency-level education program is now being undertaken through the new NASA Office of Education, which constitutes the Agency's sixth enterprise. NASA's education and public outreach objectives and focus areas is given in Table 4 below.

As a consequence of the plans and policies that have been established and implemented over the past several years, a significant national space science E/PO program is now underway as described in the OSS E/PO *Newsletters* and the *Annual Reports* that may be accessed by opening the "Education" link on the OSS homepage at <http://spacescience.nasa.gov>. This site also provides access to the two key documents that establish the basic policies and guidance for all OSS E/PO activities:

- a strategic plan entitled *Partners in Education: A Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), and
- an implementation plan entitled *Implementing the Office of Space Science Education/Public Outreach Strategy* (October 1996).

Both of these documents may also be obtained in hard copy from Dr. Jeffrey D. Rosendhal, Office of Space Science, Code S, NASA Headquarters, Washington DC 20546; E-mail: Jeffrey.D.Rosendhal@nasa.gov.

In response to the many constructive comments received from members of the space science community on how to improve, simplify, and streamline OSS's efforts to involve scientists in E/PO activities, substantial changes in procedures for incorporating E/PO into research grants that were made starting in 2001 are continued in this current NRA. Experience over the past year has clearly shown that these changes have succeeded in decreasing the overall workload on the space science community, increasing the likelihood that more E/PO proposals of merit will be funded, and more effectively encouraging successful science proposers to add an E/PO component to their "parent" research effort. In addition, OSS has worked to open up new avenues for E/PO participation for space scientists and to develop a variety of approaches that allows such contributions to be recognized and acknowledged (details may be accessed through the "Education" Web site indicated above).

A summary of the key elements of the current OSS E/PO program that apply to this NRA are as follows:

- An E/PO proposal may be submitted only by a proposer (i) whose research proposal is selected for a funding award through this NRA or (ii) whose research proposal was selected through any previous OSS NRA and that has at least 15 months remaining in its period of performance at the time of submission of the E/PO proposal (in either case, hereafter called the "parent" award);
- The cost cap for an E/PO proposal by an individual investigator is \$15K/year;
- An "Institutional Proposal" option is available that allows several OSS-funded researchers located at the same institution to collectively carry out a more ambitious, expansive E/PO program within a cost cap of \$50K/year, not to exceed \$125K over the nominal three year lifetimes of the parent awards;
- To ease the burden of NASA's administration of such small supplemental awards, the total period of performance for any E/PO award may not exceed that of its parent research award; and
- A selected Principal Investigator has two windows of opportunity to submit an E/PO proposal, either: (i) no later than 60 days after the date of his/her letter of selection for the new award (with the anticipation of starting the E/PO activity within the first half of the first year of the parent research award); or (ii) no later than 90 days in advance of the yearly anniversary date of their award (with the anticipation of starting the E/PO activity in conjunction with the next year's funding supplement for the parent award).

For further details and specific guidance and information on preparing and submitting a proposal for E/PO funding under this or any previous OSS NRA, reference the Web site at <http://spacescience.nasa.gov/education/scientists/guidelines/index.html>. Questions and/or comments and suggestions about the OSS E/PO program are sincerely welcomed and may be directed to the appropriate individual designated below.

Program Element (see Table of Contents for this NRA)	Name of E/PO Point of Contact at NASA HQ	Telephone	E-mail
Astronomy and Physics	Ms. Rosalyn Pertzborn	(202)358-1953	Rosalyn.A.Pertzborn@nasa.gov
Solar System Exploration	Dr. Marilyn Lindstrom	(202)358-1254	Marilyn.Lindstrom-1@nasa.gov
Sun-Earth Connection	Dr. Larry Cooper	(202)358-1531	Larry.P.Cooper@nasa.gov
Interdisciplinary	Dr. Larry Cooper	(202)358-1531	Larry.P.Cooper@nasa.gov

5. ITEMS OF SPECIAL IMPORTANCE

5.1 UPDATES TO SOLICITATION

Because this ROSS-2003 NRA is released far in advance of most of the deadlines given in Tables 1 and 2, additional programmatic information for any Program Element may develop before its proposals are due. If so, such information will be added as Amendments to this NRA as posted at its Web site no later than 30 days before the proposal deadline, or if this is not possible, the proposal deadline will be extended to allow a 30 day notification period. Although NASA OSS will also send an electronic notification of any such amendments to all subscribers of its electronic notification system (see item 5.3 below), it is the responsibility of the prospective proposer to check this NRA's Web site for updates concerning the Program Element(s) of interest.

5.2 ELECTRONIC SUBMISSION OF INFORMATION

OSS now requires the electronic submission of certain key elements of proposals through the World Wide Web (see below in Section 6, *Summary Information*). While every effort is made to ensure the reliability and accessibility of this Web site, and to maintain a Help Desk via E-mail and telephone, difficulty may arise at any point on the Internet, including the user's own equipment. Therefore, prospective proposers are urged to familiarize themselves with this site and to submit the required proposal materials well in advance of the deadline(s) of the Program Element(s) of interest.

5.3 ELECTRONIC NOTIFICATION OF OSS RESEARCH SOLICITATIONS

OSS maintains an electronic notification system to alert interested subscribers of the impending release of its research program announcements. Subscription to this service is free and is accomplished through the menu item "*To subscribe to the OSS electronic notification system*" found on the menu of the OSS research page at http://research.hq.nasa.gov/code_s/code_s.cfm. Owing to the increasingly multidisciplinary nature of OSS programs, this electronic service will notify subscribers of (i) all NASA OSS research program announcements regardless of the type and science objectives, (ii) amendments to the solicitations that have been released for which the proposal due date is not past, and (iii) special news that OSS wishes to communicate rapidly to those interested in its programs. Altogether a subscriber may expect to receive 40 to 50 notifications per year. Note that OSS does not release this subscription list to any other user, nor does it attempt to discern the identity of the subscribers. Regardless of whether or not this service is subscribed to, all OSS research announcements may be accessed from the menu listing *Current (Open) Solicitations* at the Web site given above as soon as they are posted (typically by 8:30 AM Eastern Time on their date of release).

5.4 ARCHIVES OF PAST SELECTIONS

For more information about the types of research supported by the program elements in previous editions in this series of ROSS NRA's, abstracts for currently funded investigations are available through the menu listing *Past/Archive Solicitations & Selections* at http://research.hq.nasa.gov/code_s/code_s.cfm.

6. SUMMARY INFORMATION APPLICABLE TO THIS NRA

• Program Alpha-Numeric Identifier	NRA 03-OSS-01
• Date of NRA Release	January 31, 2003
• Access to text of solicitation	Link through the menu listings <i>Research Solicitations</i> → <i>Current (Open) Solicitations</i> starting from the OSS home page at http://spacescience.nasa.gov .
• Guidance for preparation and submission of proposals (including default page limits)	<i>NASA Guidebook for Proposers Responding to a NASA Research Announcement (NRA)-2003</i> at URL http://www.hq.nasa.gov/office/procurement/nraguidebook/
<p>• <i>Notice of Intent (NOI) to Propose</i> (encouraged but not required):</p> <p>- Desired due date</p> <p>- Web site for electronic submissions</p> <p>- Late submission (up to 5 days prior to Proposal Deadline)</p>	<p>- See Tables 1 or 2 below for Program Element(s) of interest.</p> <p>- Open for ~30 days starting ~60 days prior to Proposal Deadline: access at http://research.hq.nasa.gov, then select the cognizant OSS Division from the menu entitled "Division Specific Opportunities" (for help, address an E-mail to: proposals.hq@nasa.gov, staffed Monday thru Friday 8:00 AM - 6:00 PM Eastern Time).</p> <p>- Submit information specified in Section 3.1 of <i>NASA Guidebook for Proposers</i> by E-mail to proposals.hq@nasa.gov.</p>

<ul style="list-style-type: none"> • <i>Cover Page/Proposal Summary and Budget Summary:</i> - Deadline - Budget Summary - Web site for electronic submission 	<ul style="list-style-type: none"> - Same as for proposals (see Tables 1 or 2 for Program Element(s) of interest); print completed items from Web site http://research.hq.nasa.gov Units of dollars only (not K\$). - Available for submissions starting ~45 prior to Proposal Deadline: Open http://research.hq.nasa.gov and select the cognizant OSS Division from the menu entitled "Division Specific Opportunities" (for help, address an E-mail to: proposals.hq@nasa.gov, Monday thru Friday 8:00 AM - 6:00 PM Eastern Time).
<ul style="list-style-type: none"> • Proposal page limits 	<p>Unless otherwise specified in Program Element in Appendix A, default values are given in Section 2.3 of <i>NASA Guidebook for Proposers</i>.</p>
<ul style="list-style-type: none"> • Submission of proposal (including printout of <i>Cover Page/Proposal Summary/Budget Summary</i>): - Required Number - Deadline - Address for submission by U.S. Postal Service, commercial delivery, or private courier 	<ul style="list-style-type: none"> - Signed original proposal plus 15 copies (unless otherwise specified in Program Element in Appendix A). - 4:30 PM ET on date in Tables 1 or 2 for Program Element of application. <p>Name of Program Element ROSS-2003 NRA <u>Office of Space Science</u> NASA Peer Review Services 500 E Street, SW, Suite 200 Washington, DC 20024 Telephone: (202) 479-9030</p>

<ul style="list-style-type: none"> • Selecting Official 	Cognizant Division Director for Program Element of application (unless otherwise noted), NASA Office of Space Science.
<ul style="list-style-type: none"> • Announcement of selections 	Goal: 150 days after Proposal Deadline <u>or</u> passage of NASA's Fiscal Year 2004 budget, whichever occurs last.
<ul style="list-style-type: none"> • Initiation of funding for new awards 	Goal: 46 days after proposal selections.
<ul style="list-style-type: none"> • Further information: <ul style="list-style-type: none"> - For a <u>specific</u> Program Element - For <u>general</u> NRA policies and procedures 	<ul style="list-style-type: none"> - See cognizant Program Officer(s) identified at end of each Program Element in Appendix A. - Dr. J. David Bohlin Office of Space Science Code S NASA Headquarters Washington, DC 20546-0001 E-mail: J.David.Bohlin@nasa.gov

7. CONCLUDING STATEMENT

Your interest and cooperation in responding to this ROSS-2003 NRA for the Office of Space Science's supporting research and analysis programs are welcome. In addition, comments about the inclusive nature and/or structure of this NRA are also sincerely solicited and may be directed to either the Program Officers identified for each of the Program Elements in Appendix A or to the point of contact for "general NRA policies and procedures" identified in the *Summary Information* above.

Richard R. Fisher
Director
The Sun-Earth Connection Division

Colleen N. Hartman
Director
Solar System Exploration Division

Anne L. Kinney
Director
Astronomy and Physics Division

TABLE 1

SCIENCE PROGRAM ELEMENTS SOLICITED IN THE ROSS-2003 NRA
(in order of the proposal due dates)

NRA Appendix	Science Program Element (see Appendix A)	NOI Due Date [M/D/Y]	Proposal Due Date [M/D/Y]	Relevant OSS Science Themes [1]			
				ASO	SEU	ESS	SEC
A.2.17	Discovery Data Analysis	2/28/03	3/28/03			X	
A.3.6	Sun-Earth Connection Instrument Development	2/28/03	3/28/03				X
A.2.15	Mars Fundamental Research [2]	2/21/03	4/11/03			X	
A.1.5	Astronomy & Physics Research and Analysis	2/26/03	4/18/03	X	X		
A.2.9	Planetary Atmospheres [2]	2/28/03	4/18/03			X	
A.2.16	Mars Instrument Development Project	2/26/03	4/30/03			X	
A.2.3	Planetary Geology and Geophysics [2]	3/07/03	5/02/03			X	
A.2.14	Astrobiology Science and Technology for Exploring Planets	3/07/03	5/09/03	X		X	
A.3.5	Sun-Earth Connection Guest Investigators	3/14/03	5/16/03				X
A.2.2	Cosmochemistry [2]	3/28/03	5/23/03	X		X	
A.2.4	Origins of Solar Systems [2]	4/11/03	6/13/03	X		X	
A.2.8	Near Earth Object Observations [2]	4/23/03	6/20/03	X		X	
A.2.7	Planetary Astronomy [2]	4/25/03	6/27/03	X		X	
A.1.2	Astrophysics Data Analysis	5/14/03	7/11/03	X	X		
A.1.3	Long-Term Space Astrophysics	5/14/03	7/11/03	X	X		
A.1.4	Astrophysics Theory	5/16/03	7/16/03	X	X		

A.2.6	Sample Return Laboratory Instruments & Data Analysis	5/16/03	7/18/03	X		X	
A.3.3	Geospace Sciences	5/23/03	7/25/03				X
A.2.10	Astrobiology: Exobiology and Evolutionary Biology [2]	6/06/03	8/08/03	X		X	
A.2.11	Planetary Instrument Definition and Development	6/06/03	8/08/03			X	
A.2.5	Mars Data Analysis	6/11/03	8/15/03			X	
A.1.6	RXTE Guest Investigator - Cycle 9	7/11/03	9/12/03	X	X		
A. 1.8	FUSE Guest Investigator - Cycle 5	8/08/03	9/19/03	X	X		
A.3.7	Living With a Star Targeted Research & Technology	8/13/03	10/23/03			X	X
A.2.13	Astrobiology Science and Technology Instrument Development and Mission Concept Studies	9/05/03	11/07/03	X		X	
A.1.7	SWIFT Guest Investigator - Cycle 1	10/6/03	12/1/03	X	X		
A.3.2	Solar and Heliospheric Physics	12/10/03	2/13/04				X
A.3.4	Sun-Earth Connection Theory	Not	solicited in	this	NRA.		X
A.2.12	Planetary Major Equipment [2]	See ESS Program Element of interest. [2]		X		X	

Notes:

[1] ASO: Astronomical Search for Origins; SEU: Structure and Evolution of the Universe; ESS: Exploration of the Solar System; SEC: Sun-Earth Connection.
[2] The proposals for Program Element A.2.12: *Planetary Major Equipment* may be submitted in conjunction with Program Elements A.2.2: *Cosmochemistry*; A.2.3: *Planetary Geology and Geophysics*; A.2.4: *Origins of Solar Systems*; A.2.7: *Planetary Astronomy*; A.2.8: *Near Earth Objects*; A.2.9: *Planetary Atmospheres*; A.2.10 *Exobiology*; and A.2.15 *Mars Fundamental Research*.

TABLE 2

SCIENCE PROGRAM ELEMENTS SOLICITED IN THE ROSS-2003 NRA
(in order of listing in Appendix A)

NRA Appendix	Science Program Element (see Appendix A)	NOI Due Date [M/D/Y]	Proposal Due Date [M/D/Y]	Relevant OSS Science Themes [1]			
				ASO	SEU	ESS	SEC
A.1.2	Astrophysics Data Analysis	5/14/03	7/11/03	X	X		
A.1.3	Long-Term Space Astrophysics	5/14/03	7/11/03	X	X		
A.1.4	Astrophysics Theory	5/16/03	7/16/03	X	X		
A.1.5	Astronomy & Physics Research and Analysis	2/26/03	4/18/03	X	X		
A.1.6	RXTE Guest Investigator - Cycle 9	7/11/03	9/12/03	X	X		
A.1.7	SWIFT Guest Investigator - Cycle 1	10/6/03	12/1/03	X	X		
A. 1.8	FUSE Guest Investigator - Cycle 5	8/08/03	9/19/03	X	X		
A.2.2	Cosmochemistry [2]	3/28/03	5/23/03	X		X	
A.2.3	Planetary Geology and Geophysics [2]	3/07/03	5/02/03			X	
A.2.4	Origins of Solar Systems [2]	4/11/03	6/13/03	X		X	
A.2.5	Mars Data Analysis	6/11/03	8/15/03			X	
A.2.6	Sample Return Laboratory Instruments & Data Analysis	5/16/03	7/18/03	X		X	
A.2.7	Planetary Astronomy [2]	4/25/03	6/27/03	X		X	
A.2.8	Near Earth Object Observations [2]	4/23/03	6/20/03	X		X	
A.2.9	Planetary Atmospheres [2]	2/28/03	4/18/03			X	
A.2.10	Astrobiology: Exobiology and Evolutionary Biology [2]	6/06/03	8/08/03	X		X	

A.2.18	Planetary Protection Research	6/06/03	8/08/03	X		X	
A.2.11	Planetary Instrument Definition and Development	6/06/03	8/08/03			X	
A.2.12	Planetary Major Equipment [2]	See ESS Program Element of interest. [2]		X		X	
A.2.13	Astrobiology Science and Technology Instrument Development and Mission Concept Studies	9/05/03	11/07/03	X		X	
A.2.14	Astrobiology Science and Technology for Exploring Planets	3/07/03	5/09/03	X		X	
A.2.15	Mars Fundamental Research [2]	2/21/03	4/11/03			X	
A.2.16	Mars Instrument Development Project	2/26/03	4/30/03			X	
A.2.17	Discovery Data Analysis	2/28/03	3/28/03			X	
A.2.18	Planetary Protection Research	6/06/03	8/08/03	X		X	
A.3.2	Solar and Heliospheric Physics	12/10/03	2/13/04				X
A.3.3	Geospace Sciences	5/23/03	7/25/03				X
A.3.4	Sun-Earth Connection Theory	Not	solicited in	this	NRA.		X
A.3.5	Sun-Earth Connection Guest Investigators	3/14/03	5/16/03				X
A.3.6	Sun-Earth Connection Instrument Development	2/28/03	3/28/03				X
A.3.7	Living With a Star Targeted Research & Technology	8/13/03	10/23/03			X	X

Notes:

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[2] The proposals for Program Element A.2.12: *Planetary Major Equipment* may be submitted in conjunction with Program Elements A.2.2: *Cosmochemistry*; A.2.3: *Planetary Geology and Geophysics*; A.2.4: *Origins of Solar Systems*; A.2.7: *Planetary Astronomy*; A.2.8: *Near Earth Objects*; A.2.9: *Planetary Atmospheres*; A.2.10 *Exobiology*; and A.2.15 *Mars Fundamental Research*.

TABLE 3

**OFFICE OF SPACE (OSS) STRATEGIC GOALS,
SCIENCE OBJECTIVES AND RESEARCH FOCUS AREAS***

**Adapted from the OSS Strategic Plan – 2003 and supporting OSS "Roadmaps"*

• **Mission Statement: To Understand and Protect our Home Planet**

Strategic Goal I: Understand the Earth system and apply Earth system science to improve prediction of climate, weather, and natural hazards.

OSS Theme	Science Objectives	Research Focus Areas (RFA's)
Sun-Earth Connection	1. Understand the origins and societal impacts of variability in the Sun-Earth Connection.	(a) Develop the capability to predict solar activity and the evolution of solar disturbances as they propagate in the heliosphere and affect the Earth. (b) Specify and enable prediction of changes to the Earth's radiation environment, ionosphere, and upper atmosphere. (c) Understand the role of solar variability in driving space climate and global change in the Earth's atmosphere.
Solar System Exploration	1. Catalog and understand potential hazards to Earth from space.	(a) Determine the inventory and dynamics of bodies that may pose an impact hazard to Earth. (b) Determine the physical characteristics of comets and asteroids relevant to any threat they may pose to Earth.

• **Mission Statement: To Explore the Universe and Search for Life**

Strategic Goal II: Explore the Solar System and the Universe beyond, understand the origin and evolution of life, and search for evidence of life elsewhere.

OSS Theme	Science Objectives	Research Focus Areas (RFA's)
Sun-Earth Connection (continued next page)	1. Understand the changing flow of energy and matter throughout the Sun, heliosphere, and planetary environments.	(a) Understand the structure and dynamics of the Sun and solar wind and the origins of magnetic variability. (b) Determine the evolution of the heliosphere and its interaction with the galaxy. (c) Understand the response of magnetospheres and atmospheres to external and internal drivers.

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OSS Theme	Science Objectives	Research Focus Areas (RFA's)
(continued) Sun-Earth Connection	2. Understand the fundamental physical processes of space plasma systems.	(a) Discover how magnetic fields are created and evolve and how charged particles are accelerated. (b) Understand the coupling across multiple scale lengths and its generality in plasma systems.
Solar System Exploration	1. Learn how the Solar System originated and evolved to its current diverse state.	(a) Understand the initial stages of planet and satellite formation. (b) Study the processes that determine the characteristics of bodies in our Solar System and how these processes operate and interact. (c) Understand why the terrestrial planets are so different from one another. (d) Learn what our Solar System can tell us about extra-solar planetary systems.
	2. Determine the characteristics of the Solar System that led to the origin of life.	(a) Determine the nature, history, and distribution of volatile and organic compounds in the Solar System. (b) Identify the habitable zones in the Solar System.
	3. Understand how life begins and evolves.	(a) Identify the sources of simple chemicals that contribute to prebiotic evolution and the emergence of life. (b) Study Earth's geologic and biologic records to determine the historical relationship between Earth and its biosphere.
	4. Understand the current state and evolution of the atmosphere, surface, and interior of Mars.	(a) Characterize the present climate of Mars and determine how it has evolved over time. (b) Investigate the history and behavior of water and other volatiles on Mars (c) Study the chemistry, mineralogy, and chronology of martian materials. (d) Determine the characteristics and dynamics of the interior of Mars.
	5. Determine if life exists or has ever existed on Mars.	(a) Investigate the character and extent of prebiotic chemistry on Mars. (b) Search for chemical and biological signatures of past and present life on Mars.
	6. Develop an understanding of Mars in support of possible future human exploration.	(a) Identify and study the hazards that the martian environment will present to human explorers. (b) Inventory and characterize martian resources of potential benefit to human exploration of Mars.

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Theme	Science Objectives	Research Focus Areas (RFA's)
Astronomical Search for Origins	1. Understand how today's Universe of galaxies, stars, and planets came to be.	<p>(a) Learn how the cosmic web of matter organized into the first stars and galaxies and how these evolved into the stars and galaxies we see today.</p> <p>(b) Understand how different galactic ecosystems of stars and gas formed and which ones might support the existence of planets and life.</p>
	2. Learn how stars and planetary systems form and evolve.	<p>(a) Learn how gas and dust become stars and planets.</p> <p>(b) Observe planetary systems around other stars and compare their architectures and evolution with our own.</p>
	3. Understand the diversity of other worlds and search for those that might harbor life.	<p>(a) Characterize the giant planets orbiting other stars.</p> <p>(b) Find out how common Earth-like planets are and see if any might be habitable.</p> <p>(c) Trace the chemical pathways by which simple molecules and dust evolve into the organic molecules important for life.</p> <p>(d) Develop the tools and techniques to search for life on planets beyond our Solar System.</p>
Structure and Evolution of the Universe	1. Discover what powered the Big Bang and the nature of the mysterious dark energy that is pulling the Universe apart.	<p>(a) Search for gravitational waves from the earliest moments of the Big Bang.</p> <p>(b) Determine the size, shape, and matter-energy content of the Universe.</p> <p>(c) Measure the cosmic evolution of the dark energy, which controls the destiny of the Universe.</p>
	2. Learn what happens to space, time, and matter at the edge of a black hole.	<p>(a) Determine how black holes are formed, where they are, and how they evolve.</p> <p>(b) Test Einstein's theory of gravity and map space-time near event horizons of black holes.</p> <p>(c) Observe stars and other material plunging into black holes.</p>

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OSS Theme	Science Objectives	Research Focus Areas
(continued) Structure and Evolution of the Universe	3. Understand the development of structure and the cycles of matter and energy in the evolving Universe.	(a) Determine how, where, and when the chemical elements were made, and trace the flows of energy and magnetic fields that exchange them between stars, dust, and gas. (b) Explore the behavior of matter in extreme astrophysical environments, including disks, cosmic jets, and the sources of gamma-ray bursts and cosmic rays. (c) Discover how the interplay of baryons, dark matter, and gravity shapes galaxies and systems of galaxies.

TABLE 4

**NASA EDUCATION AND PUBLIC OUTREACH
STRATEGIC GOALS, OBJECTIVES, AND FOCUS AREAS**

- **Mission Statement: *To Inspire the Next Generation of Explorers***

Strategic Goal I: Inspire and motivate students to pursue careers in science, technology, engineering, and mathematics.

Objectives	Focus Areas
1. Improve student proficiency in science, technology, engineering, and mathematics using educational programs, products, and services based on NASA missions, discoveries, and innovations.	Provide opportunities for students to work directly with NASA space science missions, facilities, and data.
2. Motivate K-16+ students from diverse communities to pursue science and math courses and ultimately college degrees in science, technology, engineering, and mathematics.	Provide new opportunities for participation in the space science program by an increasingly diverse population, including opportunities for minorities and minority universities to compete for and participate in space science missions, research, and education programs.
3. Improve science, technology, engineering, and mathematics instruction with unique teaching tools and experiences that are compelling to teachers and students.	Provide high quality educational materials and teacher training based on space science content and focused on national curriculum standards Provide exhibits, materials, workshops, and personnel at national and/or regional education and outreach conferences.
4. Improve higher education capacity to provide for NASA's and the Nation's future science and technology workforce requirements.	Provide higher education opportunities offered through OSS research awards and other NASA research and education programs.

Strategic Goal II: Engage the public in shaping and sharing the experience of exploration and discovery.

Objectives	Focus Areas
1. Improve the capacity of science centers, museums, and other informal education institutions, through the development of partnerships, to translate and deliver engaging NASA content.	(a) Through partnerships with major science museums or planetariums, put on display or on tour major exhibitions or planetarium shows based on space science content. (b) Provide materials and technical expertise to support the development of exhibitions and programs at science museums and planetariums.
2. Engage the public in NASA missions and discoveries through such avenues as public programs, community outreach, mass media, and the Internet.	Seek out and capitalize on special events and particularly promising opportunities in the space science program to bring space science to and involve the public in the process of scientific discovery.

